R E P O R T R E S U M E S

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DESCRIPTIVE OUTLINE OF MISSOURI'S IN-SERVICE TEACHER EDUCATION PROGRAM IN ELEMENTARY MATHEMATICS.

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THIS OUTLINE HAS BEEN PREPARED TO ASSIST SCHOOL ADMINISTRATORS, TEACHERS, AND OTHERS INTERESTED IN PUBLIC EDUCATION IN UNDERSTANDING AND IMPLEMENTING THE INSERVICE PROGRAM AS DESIGNED BY THE STATE DEPARTMENT OF EDUCATION. THE IMMEDIATE OBJECTIVES OF THIS PROGRAM ARE (1) TO PROVIDE TEACHERS WITH THE OPPORTUNITY TO RAISE THEIR LEVEL OF UNDERSTANDING OF THE CONCEPTS OF ELEMENTARY MATHEMATICS AND TO LAY THE FOUNDATION FOR FURTHER SELF-IMPROVEMENT, (2) TO ILLUSTRATE THROUGH DEMONSTRATION TEACHING SOME OF THE NEW APPROACHES AND METHODS FOR PRESENTING MATHEMATICAL IDEAS TO ELEMENTARY STUDENTS, (3) TO CREATE AN ATMOSPHERE OF ENTHUSIASM AROUND THE STUDY OF MATHEMATICS FOR BOTH TEACHERS AND STUDENTS, (4) TO ACQUAINT THE TEACHERS WITH NEW CURRICULAR MATERIALS, TEACHING AIDS, MANIPULATIVE DEVICES AND THE LABORATORY APPROACH TO THE TEACHING OF ELEMENTARY MATHEMATICS, AND (5) TO PROVIDE EXPERIENCES AND MATERIALS WHEREBY TEACHERS MAY BROADEN THEIR HORIZONS RELATIVE TO EXPERIMENTAL PROGRAMS, PERTINENT LITERATURE, AND EXTRACURRICULAR ACTIVITIES IN THE FIELD OF MATHEMATICS. THE REMAINING PORTIONS OF THE OUTLINE ARE DESIGNED TO PRESENT SPECIFIC INFORMATION ON A NUMBER OF ASPECTS INVOLVED IN THE ELEMENTARY MATHEMATICS INSERVICE TEACHER EDUCATION PROGRAM SUCH AS (1) ORGANIZATION OF THE PROGRAM, (2) CLASSROOM VISITATION AND DEMONSTRATION TEACHING, (3) LENGTH, LOCATION, AND ENROLLMENT IN THE PROGRAM, AND (4) MATHEMATICAL CONTENT IN THE PROGRAM. (RP)

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ELEMENTARY

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Mathematics

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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STATE DEPARTMENT OF EDUCATION
NATIONAL DEFENSE EDUCATION
NDEA, TITLE III
Jefferson City, Missouri

DESCRIPTIVE OUTLINE

of

MISSOURI'S IN-SERVICE TEACHER EDUCATION PROGRAM

in

ELEMENTARY MATHEMATICS

under

THE NATIONAL DEFENSE EDUCATION ACT, TITLE III

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Introduction. One of the basic objectives of the National Defense Education Act is to modernize the content and upgrade the teaching of civics, English, geography, history, mathematics, modern foreign languages, reading, and science. Recognizing that the achievement of this objective depends to a great extent upon the preparation and efficiency of the teachers, Missouri's Plan for administering the Act provides finances for an in-service teacher education program.

This outline has been prepared to assist school administrators, teachers, and others interested in public education in understanding and implementing the in-service program as designed by the State Department of Education. The comments submitted here apply only to the elementary (K-8) mathematics in-service program.*

Title III of the National Defense Education Act provides the funds for securing the personnel to execute the in-service teacher education program herein described.

Intermediate Objectives. It is deemed important that this program set forth intermediate objectives so that proper orientation of the National Defense Education Act be preserved. These objectives are:

1. To provide teachers with the opportunity to raise their level of understanding of the concepts of elementary mathematics and to lay the foundation for further self-improvement.
2. To illustrate through demonstration teaching some of the new approaches to, and methods of, presenting mathematical ideas to elementary students.

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*For information regarding the junior high school or the senior high school mathematics in-service program, contact Mr. Carleton B. Fulbright, Director of NDEA, Title III, State Department of Education.

3. To create an atmosphere of enthusiasm around the study of mathematics for both teachers and students.
4. To acquaint the teachers with new curricular materials, teaching aids, manipulative devices and the laboratory approach to the teaching of elementary mathematics.
5 To provide experiences and materials whereby teachers may broaden their horizons relative to experimental programs, pertinent literature, and extracurricular activities in the field of mathematics.

Program Details. The paragraphs that follow are designed to present specific information on a number of aspects involved in the elementary mathematics in-service teacher education program. It is recognized, however, that the in-service program needs of different regions may vary. The methods for conducting the different programs may also vary. In view of this, the information given in this outline should be regarded as suggesting certain approvable practices related to the in-service program. Requests for in-service programs that are different from the one described will be evaluated on their own merits. The program is much like good "extension" work and is planned for teachers who are not taking regular college or institute (such as an NSF institute) work. IT IS HOPED THAT NO ONE WILL FOREGO AN OPPORTUNITY TO ATTEND A COLLEGE PROGRAM IN AN EFFORT TO GAIN AS MUCH FROM THE DESCRIBED IN-SERVICE PROGRAM.

Organization of the Elementary Mathematics Program. It is anticipated that this program will be built around the lecture-demonstration method of presentation. However, formality is to be held to a minimum in an effort to create an informal atmosphere for discussion.

Classroom Visitation and Demonstration Teaching. On an invitational basis the consultant will visit the classrooms of the teachers participating in the workshop. During this visit the consultant will, upon request, teach demonstration classes using modern concepts and some of the newer approaches to the teaching of elementary mathematics. It is also hoped that arrangements can be made for other teachers of the system to observe these demonstrations. In some instances it may be possible to work out arrangements for a sequential series of six to eight lessons with a particular class. Every effort will be made to visit each of the schools represented at the workshop which desire these services. However, this may not be possible due to lack of time and difficulties in scheduling.

Length and Location of Program. Plans are to conduct two series of in-service programs during the school year. The first series will begin in September, and the second series will begin in January. Each in-service program will run from eight to ten weeks, one session per week. Each session will be approximately two hours in length. The sessions will be held between 7:00 and 9:00 on Tuesday, Wednesday, and Thursday evenings. It may be possible to make an adjustment in the time of the meetings if the parties concerned so desire.

With the present staff, the maximum number of programs to be conducted during the current year is eighteen.

Enrollment. It is hoped that all who desire to attend can be accommodated, however, to insure that conditions are met for a good learning atmosphere, it may be necessary to limit the enrollment. The number of participants for the elementary in-service program is expected to be about thirty-five.

In general, the classes will be made up of teachers from the host school and from neighboring school districts. In some instances, arrangements may be made for an in-service program to involve only the teachers from one school district.

Program Credit. Due to the nature of the in-service teacher education program, it will not be possible to offer college credit, however, each teacher in attendance will receive a letter stating the nature of the program and the number of sessions attended. It is hoped that the superintendents will award some comparable recompense, perhaps in the form of salary credit, to their respective teachers who are in attendance.

Improvement. We shall be happy to receive and consider suggestions relative to the improvement of the program.

Content of Elementary Mathematics Program. The following list of topics and sub-topics will serve to give an idea of the nature of the elementary mathematics program. It is important to note that this list of topics in no way indicates the spirit in which it is to be presented. Perhaps a review of the intermediate objectives will assist in gaining insight into this point.

Introduction to sets

- Set vocabulary and operations with sets
- Application of sets to elementary mathematics

Number and numeral

- Historical background of the number concept
- Pre-numeral recordings (matching)
- Ancient systems of numeration
- Characteristics of numeration systems

Structure of a place value system of numeration

- Counting using base other than 10
- Fundamental operations with bases other than 10
- Hindu-Arabic system of numeration (decimal system)

Addition and multiplication of whole numbers

Addition and multiplication defined

Properties for addition and multiplication: closure, commutative, associative, distributive, and the identity elements

Algorisms based on the numeration systems and the properties of whole numbers

Subtraction and division of whole numbers

Subtraction and division defined

Subtraction and division as inverse operations

Algorism for subtraction and division

Number sentences and solution sets

Equations and inequalities

Operation, relation, and place holder symbols

Picturing number sentences

Ordered pairs, ratio, and rate

Rational numbers

Historical development of fractions

Structural development of rational numbers

Algorisms for rational numbers

Decimal fractions and algorisms

Integers

Physical models for the integers

Structural development of the integers

Geometry

Introduction to the language and symbolism of intuitive geometry

Concepts of measurement

Experimental programs

School Mathematics Study Group

Madison Project

University of Illinois Arithmetic Project

Stanford Elementary Mathematics Project

Reference Materials. Mimeographed materials will be given teachers during the course of the workshop. These handouts will contain pertinent information concerning the topics discussed. For those who wish to provide themselves with additional reference materials which will assist in the understanding of the topics presented, we should like to suggest the following:

TOPICS IN MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS, 29th Yearbook - National Council of Teachers of Mathematics, 1964, $4.00

STUDIES IN MATHEMATICS--A BRIEF COURSE IN MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS, School Mathematics Study Group, 1963, 472 pp.

INSTRUCTION IN ARITHEMTIC, 25th Yearbook - National Council of Teachers of Mathematics, 1960, 366 pp., $4.50

THE GROWTH OF MATHEMATICAL IDEAS, 24th Yearbook - National Council of Teachers of Mathematics, 1959, 517 pp., $5.00

BASIC CONCEPTS OF ELEMENTARY MATHEMATICS, Wm. Schaaf, John Wiley Co., 1961, 411 pp., $4.75

EXTENDING MATHEMATICS UNDERSTANDING, Osborn, DeVault, Boyd, Houston, Charles E. Merrell Books, Inc., 1961

FUNDAMENTAL CONCEPTS OF ELEMENTARY MATHEMATICS, Brumfield, Eicholz, Shanks, Addison-Wesley Publishing Company, Inc., 1962, 340 pp., $6.50

ENRICHMENT MATHEMATICS FOR THE GRADES, 27th Yearbook - National Council of Teachers of Mathematics, 1962, $3.00

THE ARITHMETIC TEACHER, Official Publication of the National Council of Teachers of Mathematics, Published monthly October through May

ELEMENTARY SCHOOL MATHEMATICS, NEW DIRECTIONS, Edwina Deans, United States Department of Health, Education, and Welfare, Office of Education, Washington, D. C., 1963, $.50

MATHEMATICS EXTENSION SERVICE--MATHEMATICS FOR TODAY'S TEACHERS, K-6, Science Research Associates, Inc., 1965

TODAY'S MATHEMATICS, James W. Heddens, Science Research Associates, Inc., 1964

EXPLORING MATHEMATICS ON YOUR OWN (Series) 18 Booklets, Johnson Norton, Webster Publishing Company, 1960 and 1963